Instructions for assembly and use

MULTICAL® 601

Kamstrup

www.kamstrup.com

1.1 MID labelling

Standard conditions of operation/measuring rates:

Meter	θ: 10℃…180℃	ΔΘ: 3K…170K
A pair of resistance temperature sensors	θ: 10℃…150℃	ΔΘ: 3K…140K
Flow meter	θ: 15℃…130℃	

Mechanical environment: M1 (solid installation with minimal vibrations).

Electromagnetic environment: E1 a E2 (house units, light industry, and industry). Signalling cables from the meter must be lead at a minimum distance of 25 cm from other installations.

Climatic environment: This product is intended for interior installation only; it must be installed in a non-condensing environment. The temperature of the environment must be between 5 and 55℃.

Maintenance and repair:
The keeper is allowed to exchange the communication module, battery, temperature sensors (a pair), and the flow meter. The temperature sensor pair and flow meter are verified separately (independent from the calculator), and thus can be exchanged individually. All repairs require a consequent verification in an accredited laboratory.

MULTICAL® 601, type 67-B/C/D is suitable for the Pt500 temperature sensors
MULTICAL® 601, type 67-A is suitable for the Pt100 temperature sensors

Battery for an exchange: Kamstrup 66-00-200-100

MULTICAL® 601, type 67-A/B/C can be connected to the ULTRAFLOW® flow meter; to a unit with an electronic collector; or to a flow meter with a Reed contact.

MULTICAL® 601, type 67-D, must be connected to a flow meter with an active 24 V impulse output.

No matter what the flow meter type is, the ‘imp/l’ must be the same on both the flow meter and calculator.

MULTICAL® 601 & ULTRAFLOW®

English

ASSEMBLY

Kamstrup

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1. General information

⚠Before installing the power meter, study this guide carefully. In case the meter is not properly installed, the Kamstrup Company withdraws all its warranty commitments.

Please, notice that it is necessary to meet the following installation conditions:

- ULTRAFLOW® compression stage: PN16/PN25/PN40, see the ; labelling. The flow meter labelling does not concern the accessories supplied.

- Kamstrup compression stage of DS temperature sensors: PN16

- The compression stage of stainless steel containers: PN25/PN40 – according to the type

If the medium temperature exceeds 90°C, we recommend using flange meters, and mounting the MULTICAL® 601 on a wall.

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2. Temperature sensor assembly

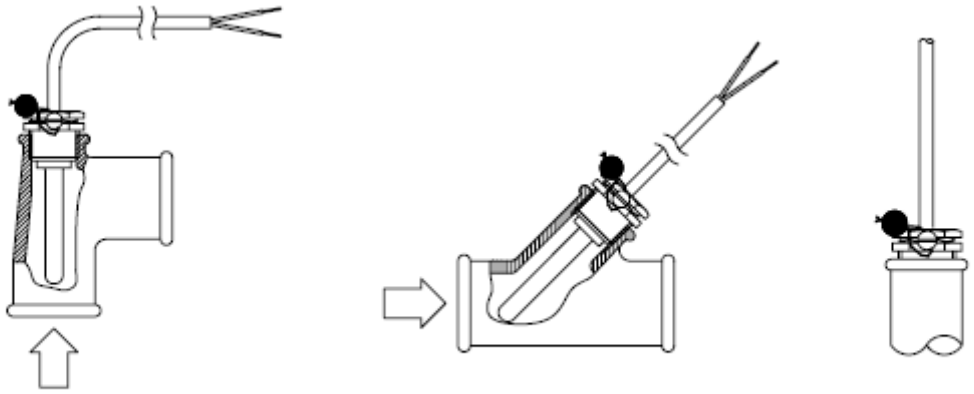
Temperature sensors used for measuring supply and return temperatures form a pair; they must never be separated form each other.

MULTICAL® 601 is usually supplied with mounted temperature sensors. According to the EN 1434 and OIML R75 standards, their cable length must not be changed. If the sensors need to be exchanged, the complete pair must always be replaced.

The red marked sensor must be placed in the supply piping. The other sensor has a blue marking, and must be mounted into the return piping.

2.1 Container sensors

It is best to mount the container sensors into T-shaped branches or 45° Y-branches. The end of the container must be placed in the direction of flow, and in the centre of water flow.



Temperature sensors must be inserted all the way to the bottom of the containers. If a short period of response is required, a non-setting heat conductive paste may be used.

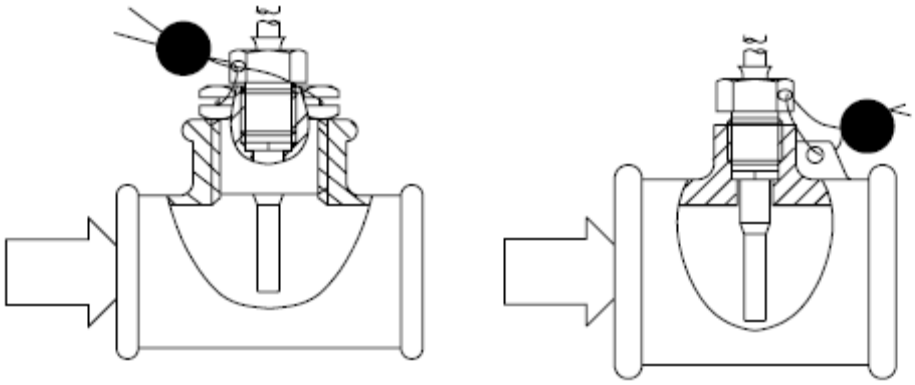
Insert the plastic case of the sensor cable into the sensor container, and fasten the cable with the supplied M4 screw, which has an opening for a sealing wire. The screw is only to be tightened with your fingers. Seal the containers using the seal and wire.

2.2 Short direct temperature sensors

Short direct sensors can be mounted into special ball valves or special T-parts. Both contain threads up to the R1 size, and a built-in M10 clutch for a short direct sensor.

For assembly into existing heating installations equipped with standard T-shaped branches, the Kamstrup A/S Company is able to supply brass inserts of R½ and R¾ size, suitable for short direct sensors.

Short direct sensors can also be installed directly into all ULTRAFLOW® machine versions, with G¾ and G1 threads, on the flow parts of the meter. Fasten the brass sensor inserts lightly (to ca 4 Nm), using a 12 mm wrench, and seal the sensors with seal and wire.



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3. Information ‘E’ codes

MULTICAL® 601 continuously monitors a range of important functions. In case of serious damage in the measuring system or installation, an ‘Info’ note appears on the display. The information code can be read by pressing and holding the left top button, until the ‘Info’ note shows up on the display. The information code only appears if there is an error.

Information Code	Description	Time of response
000	No error	-
001	Supply voltage disconnected	-
008	T1 temperature sensor out of the measuring range	1 to 10 min.
004	T2 temperature sensor out of the measuring range	1 to 10 min.
032	T3 temperature sensor out of the measuring range	1 to 10 min.
064	Cold water system leak	24 hrs
256	Heating system leak	24 hrs
512	Heating system crack	Ca 120 sec

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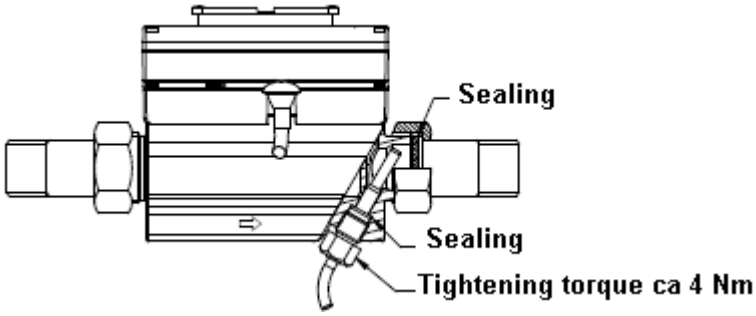
4. Assembly of the flow section

Before the assembly of the flow section, carefully wash the system and remove protective lids (plastic diaphragms). The correct flow meter position (in supply and return piping) is shown on the label of the MULTICAL® 601 front. The direction of the flow is marked with an arrow on the side of the flow meter.



Pipe union and sealing must be mounted as given in the picture. ULTRAFLOW® does not require any direct sections in front of and behind the meter; however, to reach the optimal installation conditions, we recommend the following:

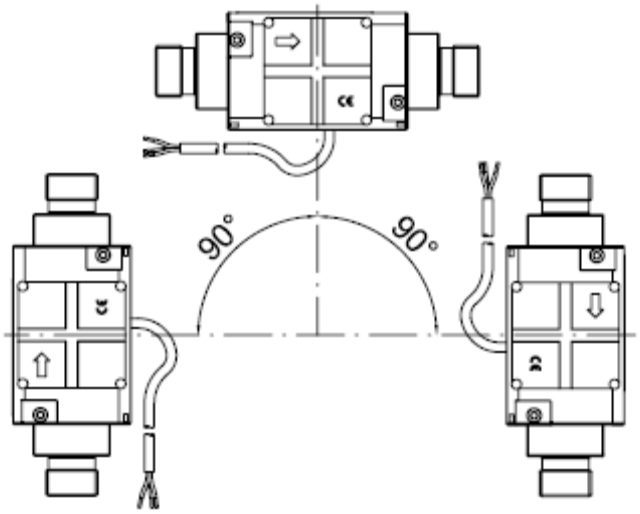
Dimensions		Recommendation
DN15 to DN80	qp 0.6 to qp 40	Min. 5 x DN in front of the meter
DN100 to DN250	qp 60 to qp 1000	Min. 10 x DN in front of the meter Min. 3 x DN in front of the meter

CEN CR 13582 installation requirements must be followed.

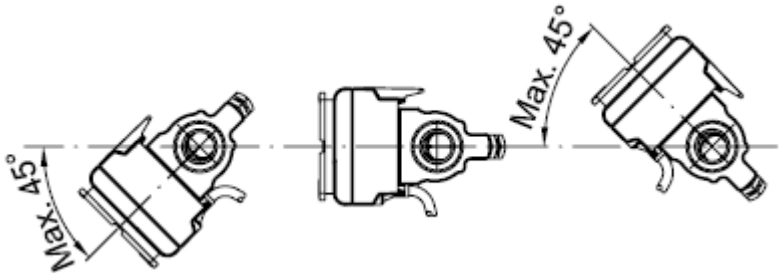
To prevent cavitations, the ULTRAFLOW® operating pressure must be min. 1.5 bar for qp min. 2.5 bar for qs (4.5 bar for DN80). This requirement is valid for temperatures up to approx. 80°C.

ULTRAFLOW® must not be exposed to pressures lower than the pressure of surrounding environment (vacuum).

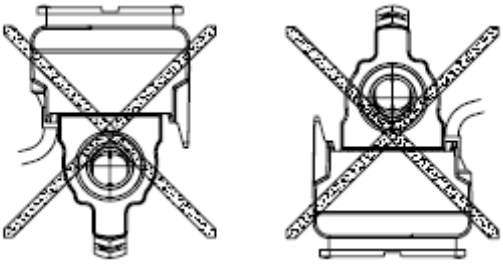
4.1 ULTRAFLOW® assembly



ULTRAFLOW® must be installed in either horizontal or vertical position, or under any angle in between these two positions.



ULTRAFLOW® can be rotated up to ±45°, according to the piping axis.



ULTRAFLOW® must not be mounted so that the black plastic cover is pointed either up or down.

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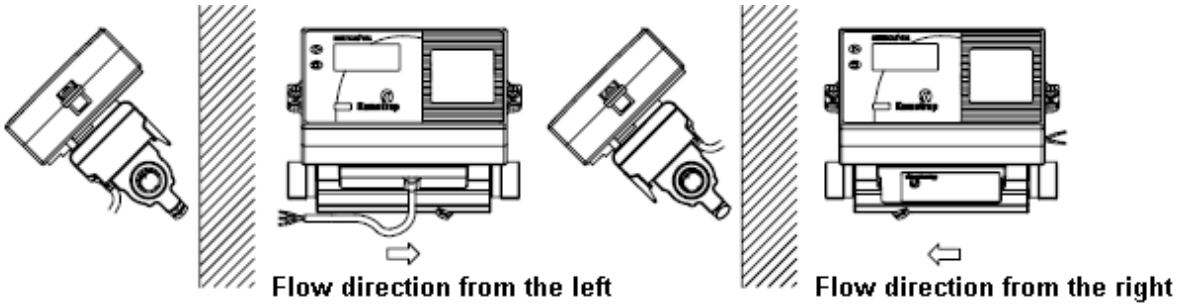
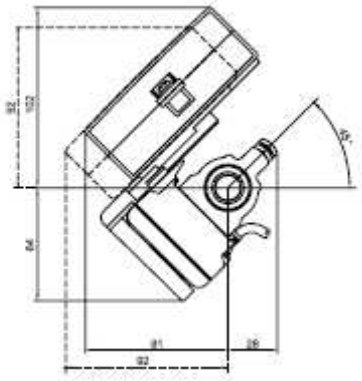
Assembly example:





MULTICAL® can be mounted in two positions using angle bracket.

The 3026-252 angle bracket needs to be ordered separately.

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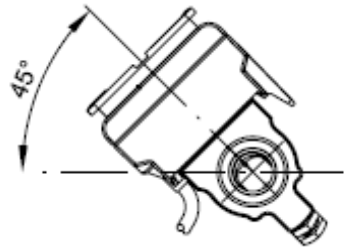
4.1.1 Dampness and condensation

In case ULTRAFLOW® is installed in a damp environment, it must be turned in a 45° angle to the piping axis, as you can see below.



If condensation is to be expected (e.g. in cooling systems), the ULTRAFLOW®, which is protected from condensation must be used.

5. Calculator assembly

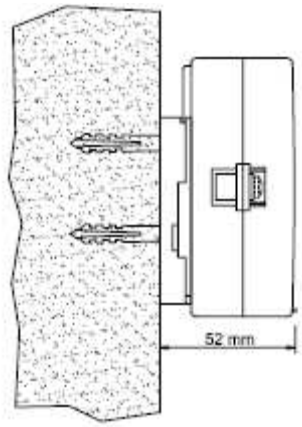
The MULTICAL® 601 calculator can be assembled in three different ways:

5.1 Compact assembly

The calculator is mounted straight onto the flow part. If needed, an angle bracket can be used. After the assembly, the calculator must be sealed with a seal and a wire. If the condensation is high (e.g. in cooling systems), we recommend to mount the calculator on a wall.

See also paragraph 4.1 'ULTRAFLOW® assembly'.

5.2 Separate assembly on the wall



The bracket for wall mounting enables you to mount MULTICAL® 601 directly onto a straight wall. Use the bracket for marking and drilling two holes, 6 mm in diameter, into the wall.

5.3 Assembly in a panel

MULTICAL® 601 can be mounted straight into panels, using the panel assembly set Kamstrup, no. 66-99-104 (192 x 144 mm).

6. Power supply

MULTICAL® 601 can be powered by a built-in lithium battery; 24 VAC internal supply module; or 230 VAC internal power module.

Two conductors from the battery or main voltage module are connected to 60 and 61 calculator clips.

⚠When connecting the conductors, polarity must be kept; connect the red conductor into clip no. 60 (+), and black conductor into clip no. 61 (-).

6.1 Battery supply

MULTICAL® 601 is connected to a lithium battery (cell D). The battery is marked with installation year, e.g. 2007, and production year.

Optimum battery life is reached if the battery is not exposed to temperatures above 30℃, e.g. by placing it on a wall.

Lithium battery voltage remains constant for most of its life (ca 3.65 V). The remaining battery capacity thus cannot be determined by voltage measuring.

The battery cannot be, and is not allowed to be, recharged; it also must not be short-circuited. Empty batteries must be handed in for required liquidation, e.g. to the Kamstrup Company.

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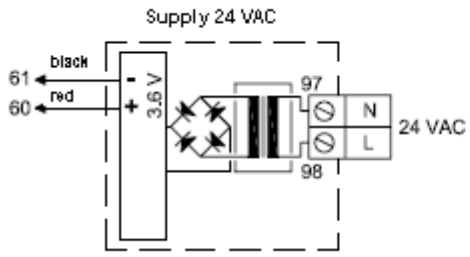
6.2 Main voltage modules

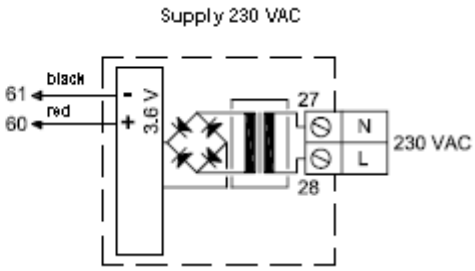
Modules belong to the safety class ll, and are connected with a double-wire conductor (without grounding) through the calculator cable grommet; the calculator is placed to the right from the connection base. Use a 5 to 10 mm outer diameter connecting cable, and secure proper disassembly and assembly of the voltage cable releaser.

Max. fuse allowed: 6 A

Assembly regulations must be followed during the assembly.



24 VAC
For example, a 230/24 V transformer, type 66-99-403 can be used.



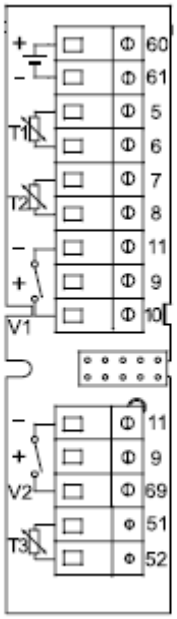
230 VAC
This module is used for direct connection to the electric network.

NOTE! MULTICAL® 601
cannot be supplied from a 24 VDC.

7. Function test

After completion of the electric meter assembly, check its functionality.
Activate water flow through the heating system, by opening heat regulators and taps.
Press top MULTICAL® 601 button, and verify the temperature and water flow figures on the display.

8. Electric connection



The polarity of T1, T2 and T3 temperature sensors is not important. When connecting ULTRAFLOW® and electronic sensor units, use the colours given for V1 and V2 flow meters.

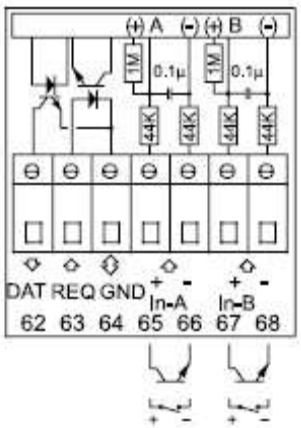
Flow meters with Reed-contact output need to be connected to clips 11-10, or 11-69.

	V1	**V2**	
-	11	11	Blue
+	9	9	Red
SIG	10	69	Yellow

	Clip number	**Standard heat and cold measurements**	**Heat measurement and leak records**	**Energy measurement in open systems**
T1	5-6	Sensor in supply piping (red)	Sensor in supply piping (red)	Sensor in supply piping (red)
T2	7-8	Sensor in return piping (blue)	Sensor in return piping (blue)	Sensor in return piping (blue)
V1	11-9-10	Flow meter in supply or return piping	Flow meter in supply piping	Flow meter in supply piping
V2	11-9-69	-	Flow meter in return piping	Flow meter in return piping
T3	51-52	-	Container/heat exchanger temperature	Reference sensor (grey)

9. Insert modules

MULTICAL® 601 can be extended with a range of functions, using the insert modules. Individual modules are briefly described below.



9.1 Data/impulse inputs

Data outputs are used, for example, for computer connection. The signal is passive and galvanic ally separated using opto-electric coupling elements. Transmission to RS232 level requires a connection of data cable 66-99-106 (D-Sub 9F) or 66-99-098 (USB), through the following connection:

62	Brown	(DAT)
63	White	(REQ)
64	Green	(GND)

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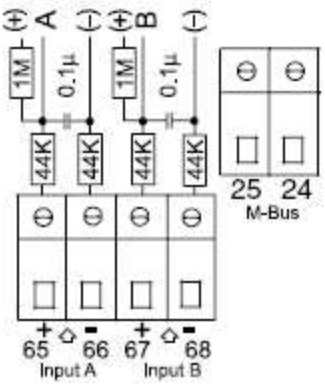
NOTE! If data reading is to be compatible with MULTICAL® 66-CDE, a top module 67-06 needs to be used in MULTICAL® 601.

Impulse inputs can be used for connecting both electric and water meters. Please, bear in mind the maximum impulse frequency and correct impulse codes (l/impulse and Wh/impulse), which are selected in FF and GG configuration.

65 – 66	Input A
67 – 68	Input B

9.2 M-Bus, type 67-00-04/08/20

M-Bus can be connected into a star-shape, ring, or bus line. According to the M-Bus Master supply, and total cabling resistance, up tpo 250 meters can be connected.



Cable resistance	< 29 Ohm
Cable capacity	< 180 nF

M-Bus network is connected to clips 24 and 25. The polarity is not important. M-Bus is supplied with impulse inputs.

NOTE! 67-00-04/08 requires the installation of top 67-06 module.

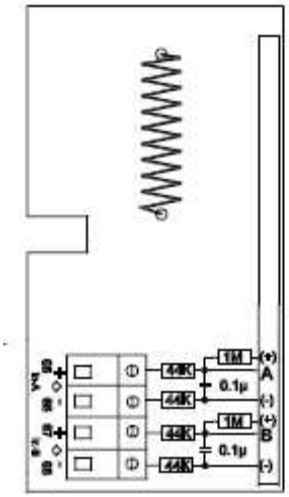
9.3 Radio/impulse inputs, type 67-00-0A/0B/25/26

The radio module is used for wireless communication over a licence-free radio frequency; it is available for both interior and exterior antennas.

Further information on the radio module are given in *Radio technical description (5512-012).*

Impulse inputs of this module are identical with the above mentioned modules.

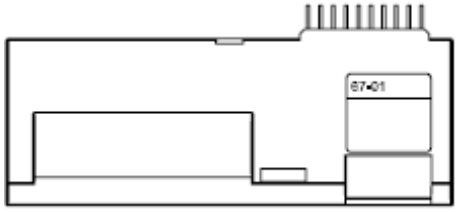
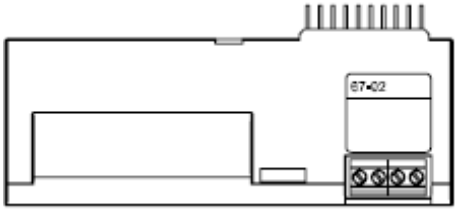
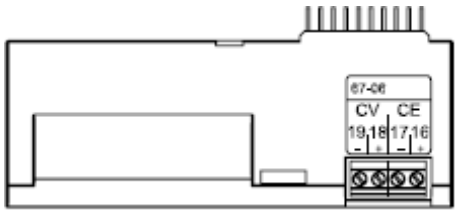
NOTE! 67-00-0A/0B requires the installation of top 67-06 module. Type 67-00-21 includes radio and router functions.



9.4 Analogue output
Type 67-00-23, *see Assembly guide 5512-369 (DK-GB-DE).*

9.5 Lon Works
Type 67-00-24, *see Assembly manual 5512-396 (DK) or 55-2-403 (GB).*

9.6 Top modules

	**Type 67-01: RTC (Real Time Clock)** The top module consists of real time clock and backup battery. When the MULTICAL® 601 is placed in the supply console, and the voltage is low, current date and time are transferred from the top module into the calculator. Top module is recommended for applications which need to have the correct date/time in permanent memory, as well as time controlled tariffs. The real time clock and backup battery represent standard equipment of all other top modules. ***This module does not use screws.***
	**Type 67-02: RTC + Δ Energy + Hourly data recorder** This top module counts the differences between heat energy in both supply and return piping, and hot supply water energy in open systems. This module also consists of an hourly data recorder. ***This module does not use screws.***
	**Type 67-06: RTC + compatibility with 66-C + 2 impulse outputs (CE and CV)** Top module secures MULTICAL® 601 compatibility with MULTICAL® 66-C, which allows using most original basic modules for MULTICAL® 66-C in the MULTICAL® 601. Moreover, the top module has two independent impulse outputs for energy (CE) and capacity (CV). Impulse resolution reflects display data (defined by CCC-code). E.g.: CCC=119 (qp 1.5): 1 impulse/kWh and 1 impulse/0.01 m3. Impulse outputs are optically isolated, and have 30 VDC and 10 mA.

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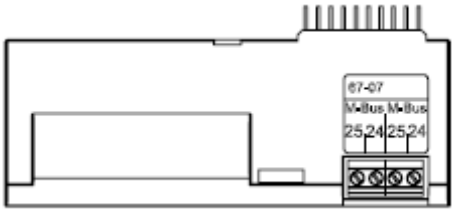
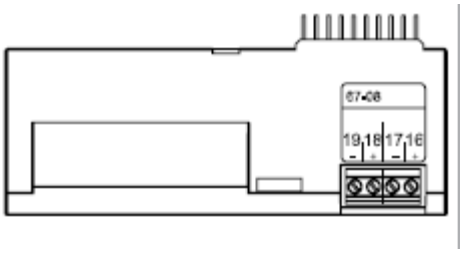
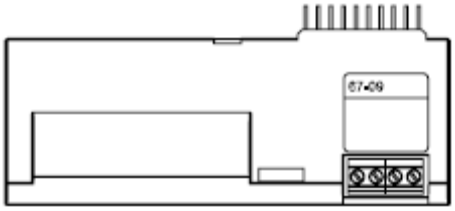
	**Type 67-07: RTC + M-Bus** An M-Bus can be connected into a star, ring, or bus line. According to M-Bus Master supply and cable length/diameter, up to 250 meters with primary addressing can be connected; even more can be connected if secondary addressing is used. Network conductor resistance: < 29 Ohm Network conductor capacity: < 180 nF Polarity of clips 24 and 25 connection is not important. Primary addresses usually consist of the last numbers in a customer number (000-250),and can be changed using METERTOOL software.
	**Type 67-08: RTC + hourly data recorder + impulse outputs** This top module has two impulse outputs for capacity and energy, which can be freely configured. They are suitable for capacity and energy impulses for heat, cold, or combined meters. Impulse resolution reflects display data (defined by CCC-code). E.g.: CCC=119 (qp 1.5): 1 impulse/kWh and 1 impulse/0.01 m^3. Impulse outputs are optically isolated, and have 30 VDC and 10 mA. Energy (CE) is usually connected to clip 16-17; capacity (CV) is then connected to clip 18-19. However, other combinations can be selected using METERTOOL software, which is also used to select the impulse duration 32 or 100 ms. Moreover, this module also includes an hourly data recorder.
	**Type 67-09: RTC + Δ capacity + hourly data recorder** This top module counts the difference between heat energy in supply and return piping, and hot supply water energy in open systems. Figure difference dV=V1-V2. This module also includes an hourly data recorder. ***This module does not use screws.***

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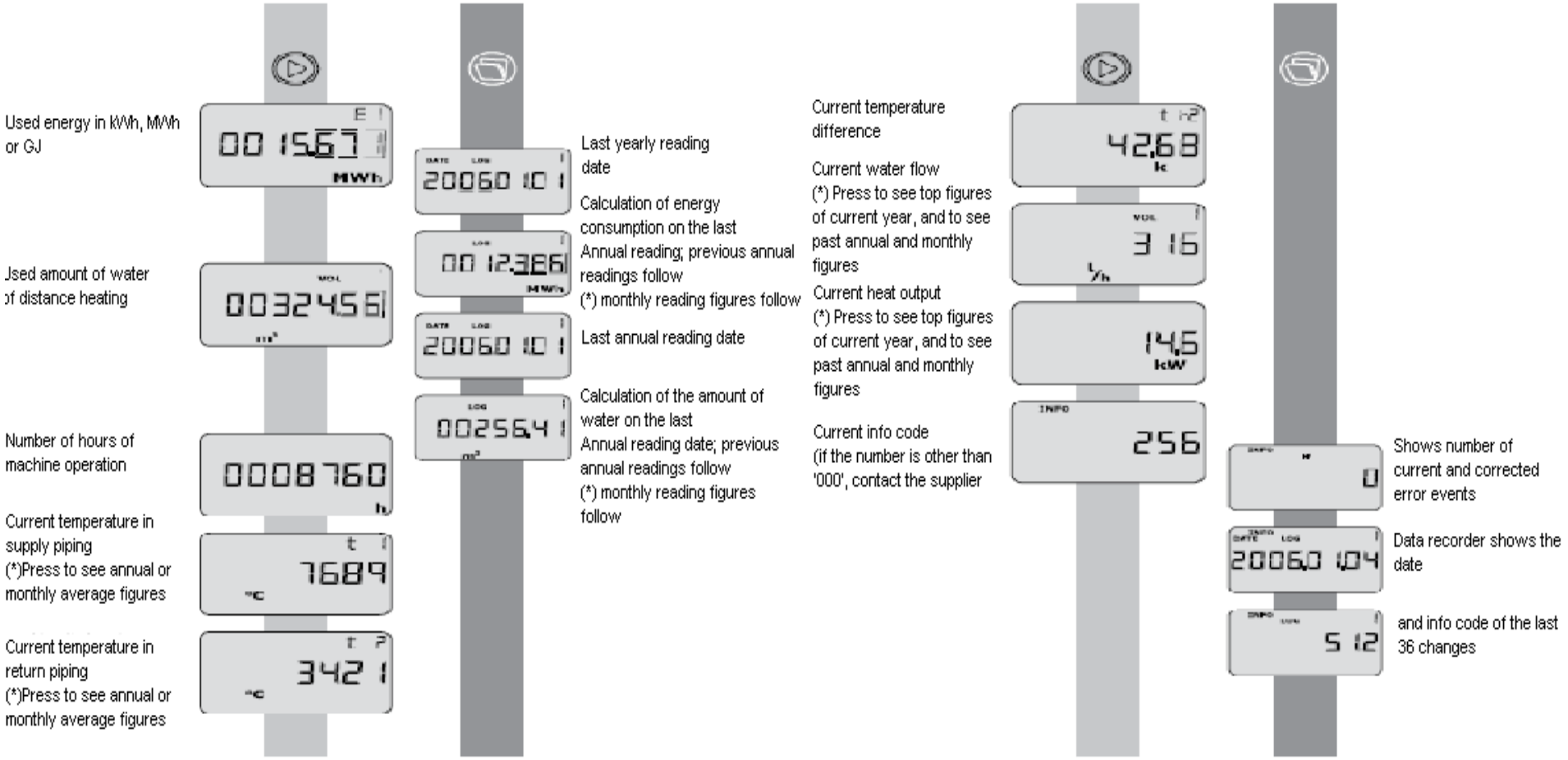
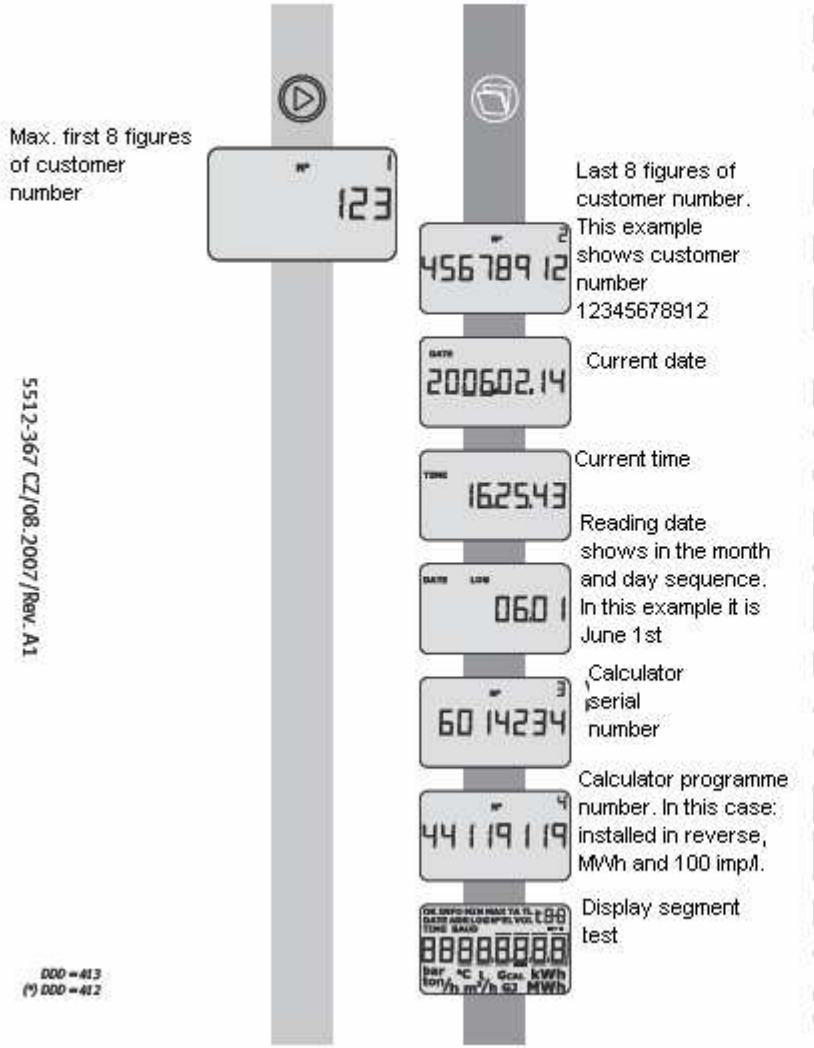

Used energy in kWh, MWh or GJ
Used amount of water of distance heating
Number of hours of machine operation
Current temperature in supply piping
(*)Press to see annual or monthly average figures
Current temperature in return piping
(*)Press to see annual or monthly average figures
Last yearly reading date
Calculation of energy consumption on the last Annual reading; previous annual readings follow
(*) monthly reading figures follow
Last annual reading date
Calculation of the amount of water on the last Annual reading date; previous annual readings follow
(*) monthly reading figures follow
Current temperature difference
Current water flow
(*) Press to see top figures of current year, and to see past annual and monthly figures
Current heat output
(*) Press to see top figures of current year, and to see past annual and monthly figures
Current info code
(if the number is other than '000', contact the supplier
Shows number of current and corrected error events
Data recorder shows the date
and info code of the last 36 changes


Max. first 8 figures of customer number
123
Last 8 figures of customer number. This example shows customer number 12345678912
456789 12
Current date
2006.02.14
Current time
16:25:43
Reading date shows in the month and day sequence. In this example it is June 1st
06.01
Calculator serial number
60 14234
Calculator programme number. In this case: installed in reverse, MWh and 100 imp/l.
44 1 19 1 19
Display segment test
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DDD = 413
(*) DDD = 412

INSTRUCTIONS FOR USE

MULTICAL® 601

Energy measurement

MULTICAL® 601 operates as follows:
Flow meter measures the amount of distance heating water (m3), which circulates in the heating system.
Temperature sensors placed in supply and return piping register cooling, i.e. the difference between incoming and outcoming temperature.

MULTICAL® 601 calculates the amount of consumed energy, based on the capacity and cooling of water circulating in distance heating system.

Display reading

After pressing the top button a new figure appears

The bottom button is used for showing past and average figures.
Four minutes after pressing the button, the consumed energy figure shows automatically.